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March 30, 1984

Docket No. 50-277
50-278

Dr. Thomas E. Murley
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Region I
631 Park Avenue
King of Prussia, PA 19406

SUBJECT: Information Relative to I.E. Bulletin 84-01, Entitled Cracks in Boiling Water Reactor Mark I Containment Vent Headers

Dear Dr. Murley:

On February 5, 1984, as a result of a report from Georgia Power that a complete, circumferential, through wall crack had been found in the Hatch Unit 2 vent header, Philadelphia Electric Company performed primary containment drywell to torus bypass tests on Peach Bottom Unit 2 and Unit 3. On February 17, 1984, in a letter to all BWR Owners, the Regulatory Response Group (RRG) distributed a General Electric Company SIL No. 402, Wetwell/Drywell Inerting, and recommended that the utilities take action on the SIL recommendations. This letter will give results of the drywell to torus bypass tests performed and provide information as to the status of each of the GE SIL No. 402 recommended actions.

The General Electric SIL No. 402 recommended that five actions be taken. The five recommendations and the current status of each are listed below.

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Recommendation 1

Evaluate Inerting System Design

Evaluate the design of the nitrogen inerting system. Investigate the potential for introducing cold (less than 40 degrees F) nitrogen and the orientation of the nitrogen port relative to the vent header, downcomers, or other equipment in the wetwell and drywell which may be in the path of the injected nitrogen. Assure that the temperature monitoring devices, the low temperature shutoff valve, and overall system design are adequate to prevent the injection of cold nitrogen into the containment.

Response

The design of the Peach Bottom liquid nitrogen facility is similar to that employed at Hatch and is typical of systems which are in widespread commercial use. These systems utilize a water bath vaporizer heated by auxiliary steam. Water bath temperatures are regulated by a temperature control valve in the steam supply line.

At Peach Bottom all liquid nitrogen supply equipment is located outdoors. A temperature switch (TS-6536) is provided in the vaporizer discharge line to protect downstream equipment from high or low temperatures (setpoints 50 degrees F and 150 degrees F). This temperature switch controls shutoff valves in the supply lines.

The outdoor installation of TS-6536 has occasionally caused operational problems which have the potential to compromise the protective function provided by this switch. During cold weather operation, the system cannot be started without bypassing the automatic shutoff valve and/or adjustment of the low temperature setpoint. On at least one occasion (Winter 1976-77, with ambient temperature below freezing), the 6" carbon steel piping downstream of TS-6536 failed as a result of liquid nitrogen entering the piping. This failure occurred in the piping near the vaporizing equipment approximately 400 feet from the Unit 2 primary containment and 600 feet from the Unit 3 primary containment. We have found no evidence of adverse low temperature effects on the containment isolation valves or piping in our review of integrated and local leak rate test results.

The physical arrangement of Peach Bottom torus inerting penetrations is such that liquid nitrogen and/or cold gases

would not impinge directly on any downcomer or the vent header, as was the case at Hatch 2. The 20-inch diameter inerting penetrations have recently been provided with debris screens supported by carbon steel structures. If very cold gases (on the order of minus 50 degrees F) were introduced through these lines, it is likely that these carbon steel structures would fail. The continued use of the current low temperature setpoint of TS-6536 (i.e., 50 degrees F) will preclude any low temperature failure problems.

A detailed review of system reliability and alternatives for improvement will be completed by the Mechanical Engineering Division of the Engineering and Research Department of PECo within three months. Schedules for completion of any additional system improvements, if required, will be developed as part of this effort.

Recommendation 2

Evaluate Inerting System Operation

Review the operating experience of the inerting system to assure that the vaporizer, the low temperature shutoff valve and the temperature indicators have functioned properly. Evaluate the plant calibration, maintenance and operating procedures for the inerting system. Assure that cold nitrogen injection would be detected and prevented.

Response

The system has had operating problems in the past as identified in Response 1 above. During the week of March 26, 1984, the vaporizer, low temperature shutoff valve, and the low temperature switch were verified to be functioning properly. To assure that this system operates properly in the future, the system will be functionally tested once a year.

The operating procedures for this system are under review and they will be updated if necessary by April 30, 1984. The operator requalification training program will be updated to include instructions on proper operation of this system. Assurance that cold nitrogen injection will be detected and prevented is under the scope of the design review referenced in Response 1 above.

Recommendation 3

Test for Drywell/Wetwell Bypass Leakage

Perform a bypass leakage test as soon as convenient to confirm the integrity of the vent system. This test should be conducted during plant operation following normal plant procedures. If no procedures exist, the following is a general guide for preparing your procedure: pressurize the drywell to approximately 0.75 psi above the wetwell pressure, maintain this drywell pressure and measure the pressure buildup in the wetwell. Any bypass leak area can then be calculated (and is limited by Technical Specifications on many plants) from the wetwell pressure and the drywell/wetwell pressure difference. This will provide an indication that the vent system integrity is intact and that no gross failure exists.

Response

On February 5, 1984, drywell to torus bypass tests were successfully performed on both Peach Bottom Units 2 and 3 using existing surveillance tests 12.6-1 and 12.6-2. These tests verified that the total leakage area that would allow drywell atmosphere to enter the torus free air volume directly (without passing through the torus water) was less than a one-inch diameter hole. The applicable technical specification 4.7.A.4.d limit at Peach Bottom is a one-inch diameter hole.

Recommendation 4

Inspect Nitrogen Injection Line

Conduct an ultrasonic test (UT) as soon as convenient of all accessible welds in the nitrogen injection line from the last isolation valve to the wetwell and drywell penetrations. Also, UT the containment penetrations and the containment shell within 6 inches of the penetration. UT is recommended because cracks would be most likely to initiate on the inside of the pipe or on the side of the metal in contact with cold nitrogen.

Response

On February 24 and 25, 1984, Maintenance Division personnel visually inspected the containment inerting piping from the outer isolation values to the purge nozzles (which connects to the torus and drywell) at Peach Bottom Units 2 and 3. The visual inspection revealed no evidence of leakage or cracks.

The Licensee has reviewed the above recommendation to perform a UT inspection on both the drywell and torus injection lines. At Peach Bottom, containment inerting is performed almost entirely through the torus injection line. It is believed that if a problem exists at Peach Bottom with the nitrogen injection piping, it would most likely occur in the torus injection line and not in the drywell injection portion of this piping. The Licensee, in an effort to reduce man rem exposure and dollars associated with the complete recommended inspection, has chosen to perform an ASME, Section XI, examination of all welds in the nitrogen injection line from the last isolation values to the torus penetration, the containment penetration and the containment shell within 6 inches of the penetration. The scope of this inspection will be increased to include the drywell injection portion of this piping if any welds fail the planned Section XI examination. This inspection will be completed on Unit 3 by April 30, 1984, and on Unit 2 by the end of the refueling outage scheduled to begin April 27, 1984. During the Unit 2 outage, portions of this pipe will be replaced under the scope of a modification unrelated to this issue. Only welds in the section of pipe not being replaced will be examined under the scope of this review.

Recommendation 5

Inspect Containment

During the next planned outage, perform a visual inspection of the vent header, downcomers and other equipment in the containment which might be expected to be affected by the injection of cold nitrogen. The vent header should be inspected on the outside and the inside. Also inspect the containment shell or steel liner for at least six inches around the nitrogen penetration.

Response

An inspection of the Unit 2 torus ring header was performed by the site test engineer group on February 20, 1984.

The ring header internals were inspected first. A 360 degree visual inspection was performed. The ring header and downcomers were found to be intact with no evidence of structural deterioration due to cold nitrogen.

In addition, entry was made into the torus proper for inspection of the external portion of the ring header. Again, a 360 degree inspection was performed. The ring header and downcomers were found to be intact with no evidence of structural deterioration.

Finally, a visual inspection was performed of the nitrogen injection penetration into the torus. The area around the injection line were found to be intact with no evidence of deterioration. The injection line terminates in the torus airspace at approximately two o'clock on the circumference of the torus and 9 feet above normal water level. Any liquid coming through the line would spill into the torus water through the catwalk grating, avoiding any other structural components.

As a result of this inspection, a discrepancy associated with Mark I containment modifications made in March of 1982 was uncovered. During the inspection of the inside of the primary containment vent header, a gouge was discovered at the first downcomer pair in torus bay 4 just above the inboard (reactor side) downcomer. The gouge measured approximately 3/4" long and 3/8" wide; and, although it was through the wall of the vent header, it did not open into the torus airspace due to the presence of a pad plate welded to the outside of the vent header. The gouge was repaired by grinding down to sound metal and weld repairing. Surface and volumetric examinations were performed.

It was concluded, based on the location of the gouge relative to the pad plate, that the vent header was gouged due to a welder error when the pad plate was installed on the vent header in March, 1982, as part of a modification to the torus.

As a result of this finding, a 100% visual inspection was performed of weld areas at other downcomer locations. Minor surface defects at 4 locations were found. The visual survey confirmed that the original gouge was an isolated occurrence.

Bechtel Power Corporation has completed a structural analysis of the vent header at the gouge location and has concluded that the integrity of the header was not degraded for either the normal operating or accident conditions. Bechtel has also confirmed that the minor surface defects found on the inside of the vent header are also not a structural concern.

The recommended inspection will be performed on Unit 3 during the next planned outage of sufficient duration that requires the containment to be de-inerted.

If you have any further questions, please do not hesitate to contact us.

Very truly yours,

cc: A. R. Blough, Site Inspector

T. J. Dente, Chairman
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